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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/473,391	12/28/1999	KENNETH C. CADIEN	042390.P8136	9927

7590

02/27/2002

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EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

10

DATE MAILED: 02/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/473,391

Applicant(s)

CADIEN ET AL.

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 25 January 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10-12, 14-25 and 27-31 is/are pending in the application.
- 4a) Of the above claim(s) 15-23 and 27-30 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-8, 10-12, 14, 24, and 25 is/are allowed.
- 6) ☒ Claim(s) 31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 10 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 depends on the canceled claim 9.

Claim 14 depends on the canceled claim 13.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 31 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Avanzino et al.(US 6,140,239).

Avanzino teaches that a dielectric layer may be formed over a substrate. The dielectric layer may have trenches therein. A barrier may be formed in the trenches and on a top surface of the dielectric layer. Metal may be deposited over the barrier. The metal (such as copper) may be polished with a slurry. A slurry includes an abrasive. Dielectric layer may comprise an oxide of silicon.

The barrier is electrically conductive, such as tantalum or tantalum nitride (it reads on the limitation of claims 2 and 12). Avanzino (col. 4, lines 10-11) Also teaches that the abrasive may comprise iron oxide.

The instantly claimed invention differs from Avanzino by specifying the slurry may includes an abrasive harder than the metal and less harder than the barrier. But because the same materials are used with the same process steps, it would inherently contain the same properties and functions as claimed, the abrasive harder than the metal (such as copper) and less harder than the barrier (such as tantalum or tantalum nitride).

After CMP of copper, Avanzino also teaches that subsequently, CMP is conducted to remove barrier layer from the upper surface of the dielectric layer **leaving the planarized surface** (col. 5, lines 43-47). Avanzino also states that a slurry containing **iron oxide enables effective planarization** to achieve a smooth surface without abrasion. Therefore, slurry containing iron oxide may be used to polish the barrier layer. Furthermore, during CMP of copper, because CMP (etch)process does not stop **instantaneously**, and the copper layer is harder than the barrier layer, therefore a portion of the **soft** barrier layer would have been inherently removed.

Response to Arguments

4. Applicant's arguments filed January 25, 2002 have been fully considered but they are not persuasive.

In response to applicant's argument that the cited reference fails to disclose or suggest polishing barrier layer with same slurry, as stated in the office action, After CMP of copper, Avanzino also teaches that subsequently, CMP is conducted to remove barrier layer from the upper surface of the dielectric layer **leaving the planarized surface** (col. 5, lines 43-47). Avanzino also states that a slurry containing **iron oxide enables effective planarization** to achieve a smooth surface without abrasion. Therefore, slurry containing iron oxide may be used to polish the barrier layer. Furthermore, during CMP of copper, because CMP (etch)process does not stop **instantaneously**, and the copper layer is harder than the barrier layer, therefore a portion of the **soft** barrier layer would have been inherently removed.

Conclusion

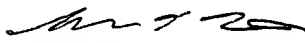
5. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is 703-3050222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-3083836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-3055408 for regular communications and 703-3053599 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-3082934.

K-C C
2-25-2002


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